REMARKS/ARGUMENTS

The claims are 2, 4, 9, 11-13, 16-21 and 24. Claim 2 has been amended to better define the invention and to incorporate subject matter previously appearing in claims 17 and 23, and claim 17 has been amended and claim 23 has been canceled in view of the amendment to claim 2. Claims 1 and 3 have also been canceled, and claims 9, 11-13, 16, 17, 19, 20 and 24, which previously depended on claim 1, have been amended to depend on claim 2. Claims 11, 21 and 24 have also been amended to improve their form.

Claim 2 now recites the additional requirement that index m is 1 and index l is 1 instead of 0 or 1. Thus, the presence of urethane groups or urea groups, respectively, is mandatory. Claim 17 therefore has been amended to specify a minimum amount of 0.02 mmol/g of urethane groups or of urea groups.

Support for the claims may be found in the disclosure, *inter alia*, at pages 36-38 and the original claims. Reconsideration is expressly requested.

Claims 11, 12, 21, and 24 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In response, Applicants have amended claims 11, 12 and 24 to depend on claim 2, and have amended these claims and claim 21 to improve their form. It is respectfully submitted that all currently pending claims fully comply with 35 U.S.C. §112, second paragraph, and Applicants respectfully request that the rejection on this basis be withdrawn.

With respect to the Examiner's rejection of claims 12 and 24 as being silent as to the number of carbon atoms even though these claims depend on a claim that specifies "at least 3 carbon atoms" or "at least 5 carbon atoms," it is respectfully submitted that claims 12 and 24 as amended are sufficiently definite. These claims simply specify the particular anion of the catalyst salt b) as being specific branched carboxylic acids, and due to the dependency of these claims on claim 2, the at least one anion must have a (cyclo)alkyl chain on the carboxyl group of at least 3 carbon atoms for such branched carboxylic acids.

Claims 1, 2, 9, 11-13, 16-21 and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Yano et al. U.S. Patent No. 6,077,896* in view of *Schwabe et al. U.S. Patent No.*

6,218,461. Claims 1-4, 9, 11-13, 16-21, and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Yano et al.* and *Schwabe et al.* in view of *Bublewitz et al. U.S. Patent Application Publication No. 2002/0156186*. Claims 1-2, 9, 11-13, 16-21 and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Yano et al.* and *Schwabe et al.* in view of *Bachon et al. U.S. Patent Application Publication No. 2005/0260401*.

Claims 1-2, 9, 11-13, 16-21, and 23-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Yano et al.* in view of *Staiger et al. U.S. Patent No. 5,304,621*. Claims 1-4, 9, 11-13, 16-21 and 23-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Yano et al.* and *Staiger et al.* and further in view of *Bublewitz et al. '186*.

In response, Applicants have canceled claims 1, 3 and 17 and have amended claims 9, 11-13, 16, 17, 19-21 and 24, have amended claim 2 to better define the invention, and respectfully traverse the Examiner's rejection for the following reasons.

As set forth in amended claim 2, Applicants' invention provides a condensation-crosslinking two-component dental

material with a component A containing at least one alkoxysilyl-functional polyether and a component B containing at least one catalyst and water. The at least one catalyst is a specific catalyst salt as specified in claim 2.

Thus, Applicants' condensation-crosslinking two-component dental material differs from the primary reference to *Yano et al.* in at least the following ways:

- the field of application of the curable compositions,
- the use of particular catalyst salts, and
- the two-component formulation.

Concerning the field of application, Applicants' composition as set forth in amended claim 2 is specifically directed to a dental material which differs considerably from an elastic sealant in the fields of building and construction works and industrial applications as disclosed by *Yano et al.* See column 7, lines 3-5 of *Yano et al.* This difference is reflected in particular by two characteristics: The condensation-crosslinking dental material must be storage stable over extended periods prior to use and the condensation-crosslinking dental material must crosslink within a short time (during minutes or tens of

minutes) and at relatively low temperatures when applied to a patient's mouth.

In contrast, the curing times according to *Yano et al.* are in the range of days at ambient conditions of 23°C/55% RH (see column 7, line 34 to column 8, line 16 of *Yano et al.*), which appears to be appropriate for a building sealant material. Even if "more severe" conditions of 36.5°C/100% RH (as considered by the Examiner in a patient's mouth) are applied, however, the curable composition of *Yano et al.* would never crosslink during minutes or tens of minutes. In addition, the curable composition of *Yano et al.* seems to be storage stable only in a tightly closed state, i.e. exclusion of humidity (see column 5, line 66 to column 7, line 2). Therefore, it is respectfully submitted that the curable composition according to *Yano et al.* is entirely unsuitable for dental purposes.

As to the use of particular catalyst salts, *Yano et al.* merely gives a very general definition for the catalyst with a variety of alternatives. See column 5, line 43 to column 6, line 7 of *Yano et al.* As one alternative, "salts of said amine compounds with carboxylic or other acids" are mentioned. See column 6, lines 2-3 of *Yano et al.* Preferred catalysts from the

curability viewpoint, however, are organometallic compounds and amine compounds, not particular salts. See column 6, lines 8-11 of *Yano et al.*

In contrast, Applicants' condensation-crosslinking two-component dental material as recited in amended claim 2 uses a particular selection of specific strong bases and specific weak acids each having certain important key properties (like defined pK_{BH+} values) which are demonstratively essential for obtaining the condensation-crosslinking dental material having high reactivity with short crosslinking times but at the same time extended storage life.

Hence, the discovery of selected salts when used as condensation-crosslinking catalysts results in the above-identified profile of a condensation-crosslinking dental material.

Finally, *Yano et al.* describes the curable composition to be possible as a two-part or a one-part composition. See column 6, lines 61-63 of *Yano et al.* The one-part composition, however, is preferred, because the Examples of *Yano et al.* solely refer thereto and the one-part composition is said to endure long-

period storage. See column 6, lines 66-67 of *Yano et al.* But as the compositions disclosed by *Yano et al.* cure in the presence of ambient humidity, a storage stable one component formulation of the composition of *Yano et al.* must be stored in an air-tight closed container (see Example 1 of *Yano et al.*).

In contrast, Applicants' condensation-crosslinking two-component dental material contains water in component B but nonetheless is storage stable for months or even years, while the one-part curable composition of *Yano et al.* "rapidly" undergoes curing from the surface when exposed to atmospheric conditions, i.e. ambient humidity (see column 6, line 67 to column 7, line 2 of *Yano et al.*).

Regarding the argument of the Examiner that Applicants failed to show that the composition of *Yano et al.* would not have the recited setting time under the conditions in a patient's mouth, it should be noted that all examples of *Yano et al.* use Kaneka MS-polymers, preferably Kaneka MS 203 and MS 303 as base polymers (Mr. Yano being an employee of Kaneka). Attached hereto please find a data sheet of Kaneka describing MS polymers. It is respectfully submitted that this data sheet clearly demonstrates that these polymers - contrary to the condensation-crosslinkable

polyether used in Applicants' dental material recited in claim 2 as amended - contain neither urethane groups nor urea groups as bridging groups for the reactive alkoxy silyl groups. The presence of these groups is now a mandatory requirement of component a) recited in Applicants' claim 2 as amended. The Examiner's attention is directed to the following portions of the attached Kaneka data sheet: page 1, 1st section; page 2, structural formula for Kaneka's polymer; page 2, table referring to "Non-isocyanate"; page 3, 1st table referring to types S203H and S303H which are believed to be the same polymers as MS 203 and MS 303 used in *Yano et al.*

Furthermore, in *Yano et al.* at column 7, line 27 dibutyltin diacetylacetonate is added as a catalyst, which corresponds exactly to catalyst U220H indicated on page 4, bottom, of the Kaneka data sheet. A data sheet of U220 H catalyst is also attached for the Examiner's reference.

As the composition of Applicants' claim 2 as amended differs in several respects from the composition disclosed in *Yano et al.*, it is respectfully submitted that *Yano et al.* cannot anticipate Applicants' composition as set forth in amended claim 2. Moreover, in view of the different performance of the

alkoxysilyl-functional polyethers used in *Yano et al.* and those used in Applicants' claim 2 as amended, it is respectfully submitted that *Yano et al.* cannot render obvious Applicants' composition as recited in amended claim 2.

Regarding the argument of the Examiner that the originally filed application failed to disclose that a branched alkyl group of at least 3 carbon atoms and unbranched carboxylic acid with at least 5 carbon atoms would provide unexpected results over a branched alkyl group of at least 2 carbon atoms and unbranched carboxylic acid with at least 4 carbon atoms, the Examiner's attention is respectfully directed to table 2 of the originally filed patent application. It is respectfully submitted that therein Applicants have demonstrated that branched carboxylic acids as catalyst components of the composition recited in Applicants' amended claim 2 provide the fastest setting times whereas use of unbranched and short-chain carboxylic acids results in significantly increased setting times. Acetic acid as a short-chain carboxylic acid catalyst component, for example, leads to non-acceptable setting times of more than 30 minutes. Therefore, it is respectfully submitted that the originally filed specification contains a convincing demonstration that the composition recited in Applicants' amended claim 2 is

unexpectedly superior in performance over compositions of similar chemical compositions which are outside the claimed scope.

Accordingly, it is respectfully submitted that Applicants' condensation-crosslinking two-component dental material as recited in amended claim 2 is patentable over *Yano et al.*

The secondary references to *Schwabe et al.*, *Bublewitz et al.*, *Bachon et al.*, and *Staiger et al.* have been considered but are believed to be no more relevant. None of these references discloses or suggests the specific condensation-crosslinking two-component dental material recited in Applicants' claims or the benefits that are achieved by that material.

Accordingly, it is respectfully submitted that claim 2, together with claims 4, 9, 11-13, 16-21 and 23-24 which depend directly or indirectly thereon, are patentable over the cited references.

The Examiner is invited to call Applicants' undersigned attorney to discuss the arguments presented herein should there remain any open issues that require clarification or amplification.

In summary, claims 1, 3 and 23 have been canceled and claims 9, 11-13, 16, 17, 19-21 and 24 have been amended. In view of the foregoing, it is respectfully requested that the claims be allowed and that this application be passed to issue.

Respectfully submitted,
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Attachments: Kaneka Data Sheet: "MS POLYMER™ SILYL™ SILYL-TERMINATED POLYETHERS FOR SEALANTS AND ADHESIVES OF A NEW GENERATION"

U220 H catalyst Data Sheet: "Nitto Technical Data: NEOSTANN U-220H

FJD:cmp

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: MAIL STOP AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on September 17, 2010.

Kelly Espitia

R:\Patents\B\BUBLEWITZ ET AL-14 PCT\RCE\Amendment in Response to OA in RCE 9-10.wpd

An ISO 9001 Certified System
Takasago, Osaka, Tokyo
Research, development and manufacture
of silicone reactive liquid polymer
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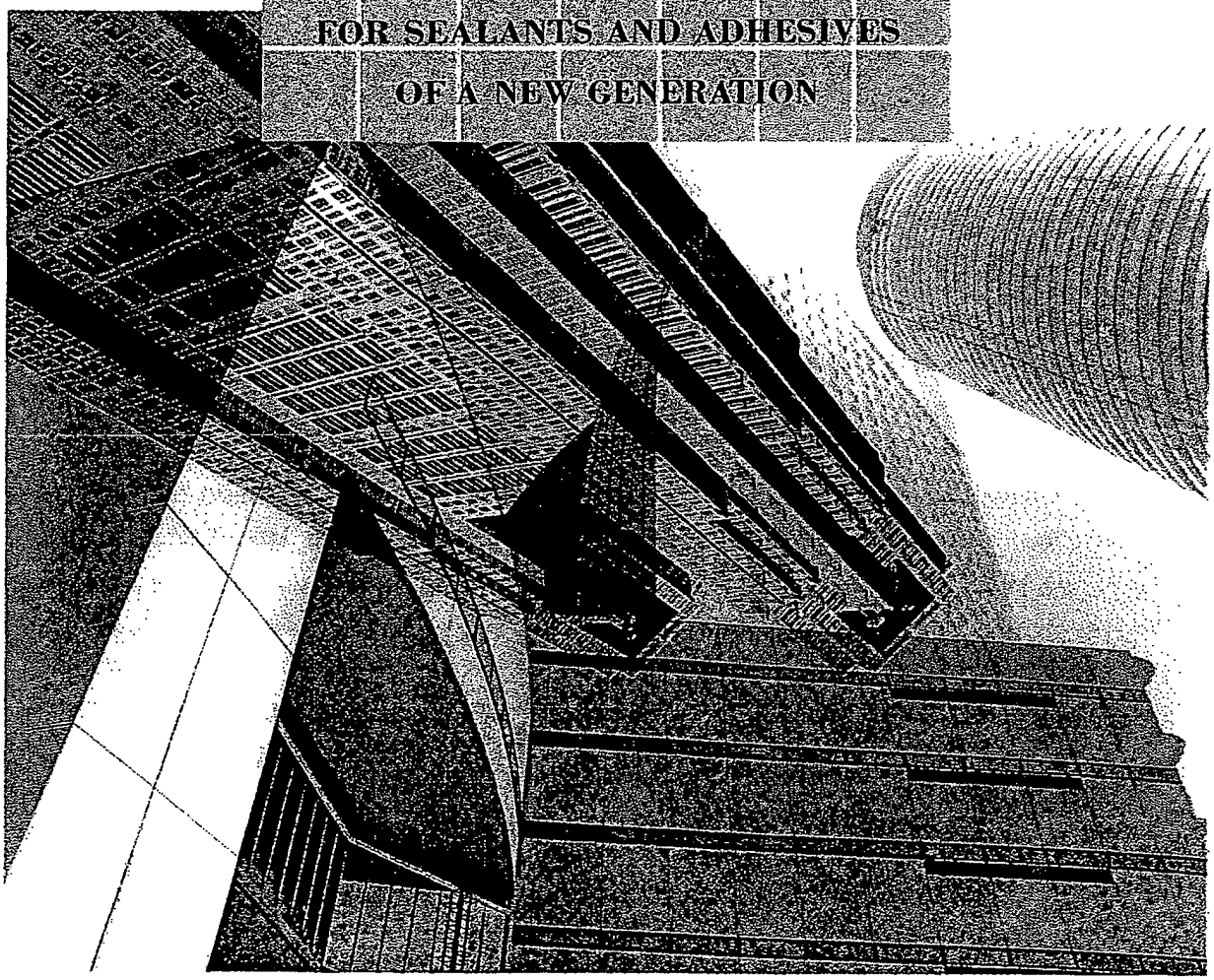
MS POLYMER™
SILYL™

SILYL-TERMINATED POLYETHERS FOR SEALANTS AND ADHESIVES OF A NEW GENERATION



kaneka

1. What is KANEKA MS POLYMER and KANEKA SILYL?

KANEKA MS POLYMER and KANEKA SILYL developed by Kaneka's unique technology are Silyl-Terminated Polyethers for non-isocyanate and moisture-curable polymer systems.

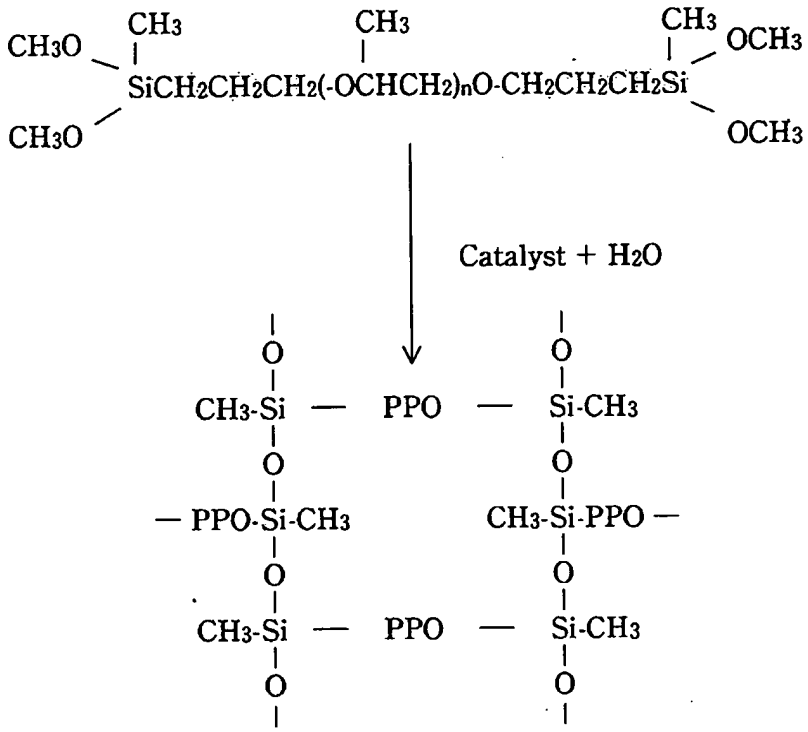
As a raw material polymer, KANEKA MS POLYMER is designed mainly for sealants/adhesives usage while KANEKA SILYL is designed mainly for elastic adhesives usage by blending with epoxy resins. Both polymers can also be used for pressure sensitive adhesives, potting compounds, coatings and binder applications. Owing to the low viscosity of both KANEKA MS POLYMER and KANEKA SILYL, no solvent is usually needed for the formulated products.

KANEKA MS POLYMER and KANEKA SILYL are telechelic reactive polymers which have polypropyleneoxide as the main chain and contain the dimethoxysilyl group at the terminals. Since the main chain does not contain any highly cohesive segments, such as urethane or urea bonds, these polymers do not need to contain any solvent nor plasticizer. Thus, KANEKA MS POLYMER and KANEKA SILYL are completely different from other sealants/adhesives polymer technology due to its unique chemical structure and curing mechanism.

KANEKA MS POLYMER and KANEKA SILYL can be formulated with various plasticizers, fillers and other additives and a wide variety of formulation designs are possible. The compounds based on KANEKA MS POLYMER and KANEKA SILYL can be cured at an ambient temperature in the presence of both moisture and hardening catalysts and transformed into a wide range of high quality elastomeric products.

Curing Mechanism and Structure of KANEKA MS POLYMER and KANEKA SILYL

Polypropyleneoxide (PPO)



Relation between chemical structure and characteristics

Structure	Characteristics
〈Main chain〉 $-(CHCH_2O)_n-$ (CH3 branch) polypropyleneoxide	1) Low viscosity and good storage stability (Good workability even at a low temperature) 2) Good compatibility with various plasticizers and additives (SP =8 to 9) 3) Good durability 4) Consistent compound quality during manufacture 5) Low specific gravity 6) Practically no odor
〈Functional group〉 $-Si(OCH_3)_2$ (CH3 branch) methyldimethoxysilyl	1) Tolerant to a wide variety of additives 2) Good balance between storage stability and high reactivity with hardening catalysts 3) Non-isocyanate : low toxicity concern 4) Good adhesion to various substrates

2. Basic Characteristics of KANEKA MS POLYMER and KANEKA SILYL

A. Polymer Types

Suggested polymer types for sealants and adhesives

Product code numbers	S203H	S303H	MAX923*1	MAX951*1*2
Type	Low modulus	High modulus	Highly weather resistant	
			High modulus	Low modulus
Viscosity at 23°C (Pa・s) *3	8.0±2.0	12.0±3.0	28.5±5.0	47.5±11.8
Specific gravity at 23°C	1.00±0.02		1.02±0.02	
pH*4	6.0-8.0		8.0-10.0	
Physical state	Liquid			
Color	Light yellow			
Suggested applications	Construction and industrial sealants/adhesives			

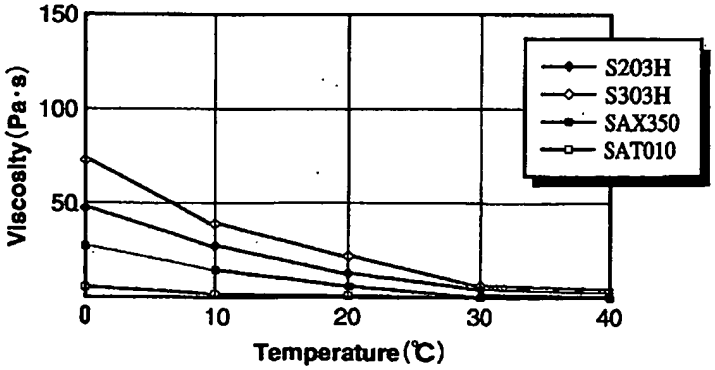
Suggested polymers for adhesives and other applications

Product code numbers	SAX350	SAT030	SAT010	SAX400
Type	Standard	High modulus	Viscosity reducer	High hardness
Viscosity at 23°C (Pa・s) *3	6.5±2.0	3.5±0.8	0.7±0.5	24.0±4.5
Specific gravity at 23°C	1.00±0.02			
pH*4	6.0-8.0			
Physical state	Liquid			
Color	Light yellow			
Suggested applications	Epoxy-blended adhesives			Industrial adhesives/ sealants

Notes The above are typical properties but no guarantee is provided.
- *1 Acrylic-modified polyether
- *2 Having alkyd paintable property
- *3 Viscometer : BM-type, rotor #4
- *4 iso-Propanol/water

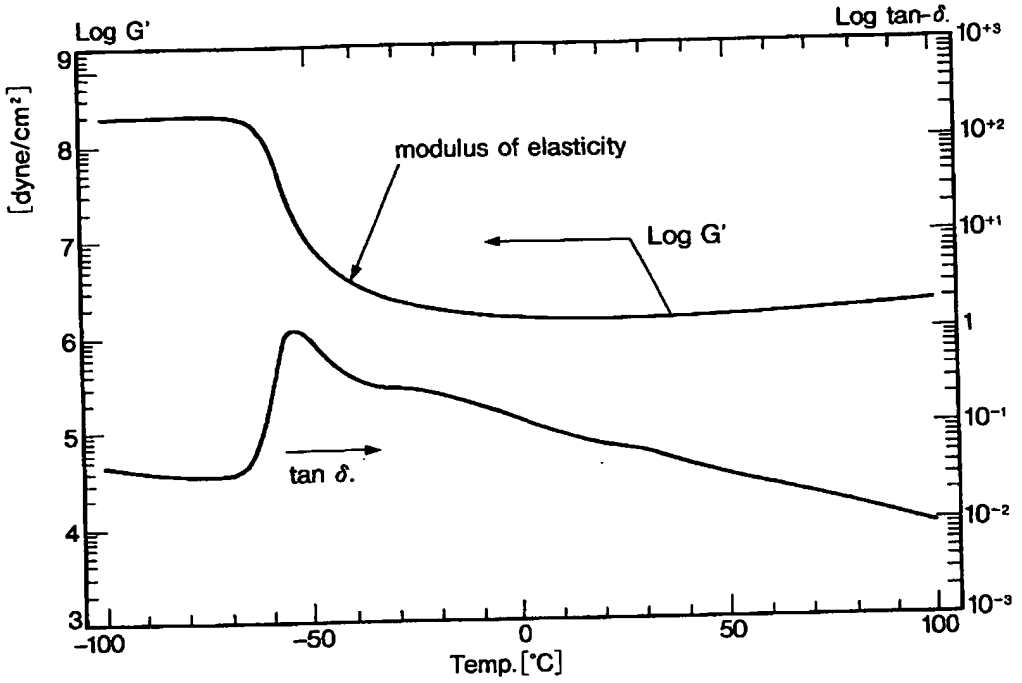
B. Viscosity at Different Temperatures

The viscosity of KANEKA MS POLYMER and KANEKA SILYL remains relatively stable throughout a wide range of temperatures. (Viscometer E type)



C. Viscoelastic Properties of Cured Polymers

The glass transition temperature of KANEKA MS POLYMER and KANEKA SILYL is around −60℃ and therefore good elasticity can be maintained even at a low temperature.



KANEKA SILYL 100phr, tin catalyst 2.0phr, cured at 23℃ 50%RH × 2days + at 50℃ × 3days

D. Physical Properties of Cured KANEKA MS POLYMER and KANEKA SILYL

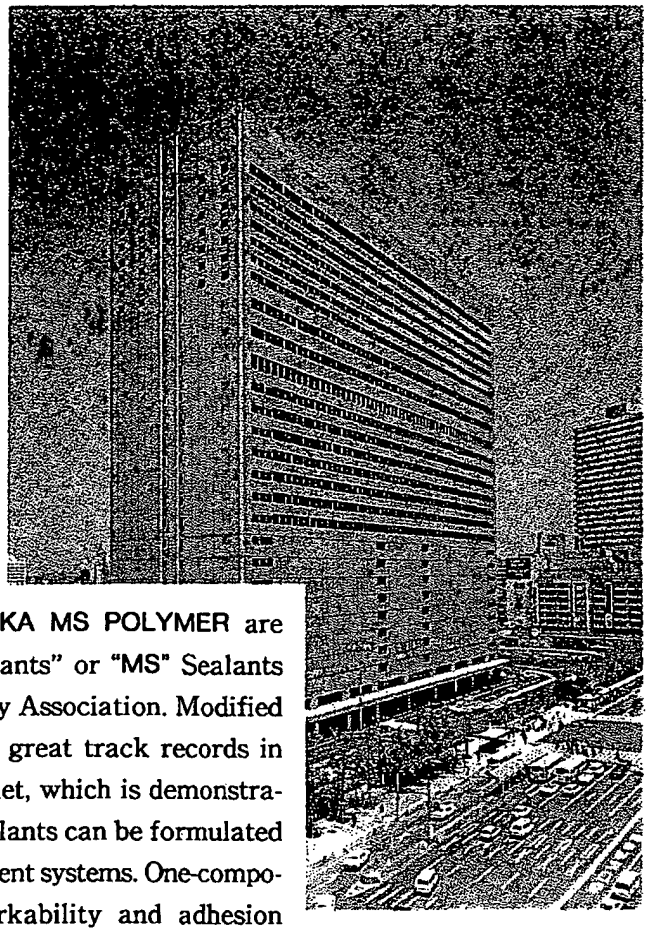
The physical properties of a dumbbell specimen made of polymers cured only with a hardening catalyst are outlined below to show the basic nature of each polymer.

Suggested polymers for adhesives and other applications

Product code numbers	Physical properties			Shore A hardness
	M100	TB	EB	
	(MPa)		(%)	
S203H	0.20	0.39	260	11
S303H	0.36	0.51	180	23
MAX923	0.34	0.46	160	19
MAX951	0.18	0.33	220	13
SAX350	0.38	0.47	140	26
SAT030	0.46	0.47	110	26
SAT010	—	0.41	<50	42
SAX400	0.51	0.58	140	31

Formulation : polymer 100phr/hardening catalyst U220H (dibutyl tin diacetylacetonate) 0.6phr
Curing condition : 23℃ 50%RH × 3days + 50℃ × 4days
M100 : 100% modulus
TB : Tensile strength at break
EB : Elongation at break

3. Sealant Application



Construction sealants based on KANEKA MS POLYMER are categorized as "Modified Silicone Sealants" or "MS" Sealants as defined by the Japan Sealant Industry Association. Modified Silicone Sealants or MS Sealants have great track records in the Japanese construction sealant market, which is demonstrated in Japanese MITI's statistics. MS sealants can be formulated in both one-component and multi-component systems. One-component systems have advantages in workability and adhesion while a fast uniform cure as well as excellent durability can be realized with multi (two) component systems.

A. Typical One-Component Sealant Formulation of MS Sealant

(Kaneka's formulation #105)

Component	Parts
KANEKA MS POLYMER	100
Plasticizer	55
Calcium carbonate	120
Titanium oxide	20
Thixotropic agent	2
Antioxidant	1
UV absorber	1
Dehydration agent	2
Adhesion promoter	3
Hardening catalyst	2

B. Production Process of One-Component MS Sealant Compound

The two key points of producing one-component "MS" Sealant are to ensure eliminating moisture from fillers and to avoid moisture contact. Two steps are absolutely necessary:

1) physical drying of fillers by hot air
2) filling well-sealed packages such as paper/aluminum composite cartridge

1. Drying fillers

Calcium carbonate	120 phr
Titanium oxide	20 phr

Generally, fillers have a moisture content of about 5,000ppm. Fillers should be dried in order to reduce water content to less than 2,000ppm. The moisture content should be checked by a Karl-Fischer water analyzer.

2. Addition of MS Polymer, plasticizer, thixotropic agent, antioxidant and UV absorber

KANEKA MS POLYMER	100 phr
Plasticizer	55 phr
Thixotropic agent	2 phr
Antioxidant	1 phr
UV absorber	1 phr

PLANETARY MIXER

Stir the mixture for 30 minutes in order to disperse the powder to the liquid material to obtain pasty consistency. While stirring under vacuum (about 3mmHg), raise the compound temperature up to about 120℃ and then slowly stir until the water content is less than 800ppm. Cool the compound to below 40℃ with slow stirring. Usually 2 to 3 hours of stirring at 110℃ under vacuum reduces moisture to less than 800ppm. However, it should be checked by a Karl-Fischer water analyzer.

3. Addition of dehydration agent and adhesion promoter

Dehydration agent	2 phr
Adhesion promoter	3 phr

Stir the compound for 30 minutes under nitrogen-sealed conditions to disperse the dehydration agent and adhesion promoter.

4. Addition of hardening catalyst

Hardening catalyst	2 phr

Dehydrate the compound chemically for 30 minutes while stirring under nitrogen-sealed conditions. Remove bubbles under vacuum for 5 minutes.

Packing machine

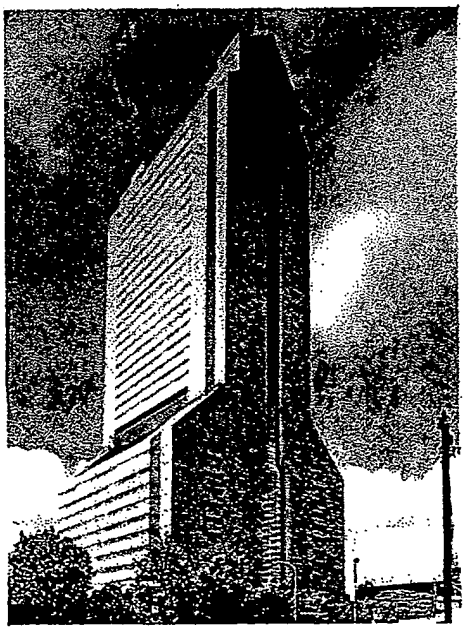
Well-sealed packing should be used to protect the compound from moisture.

C. Typical Properties of One-Component MS Sealant for Construction and Industrial Use

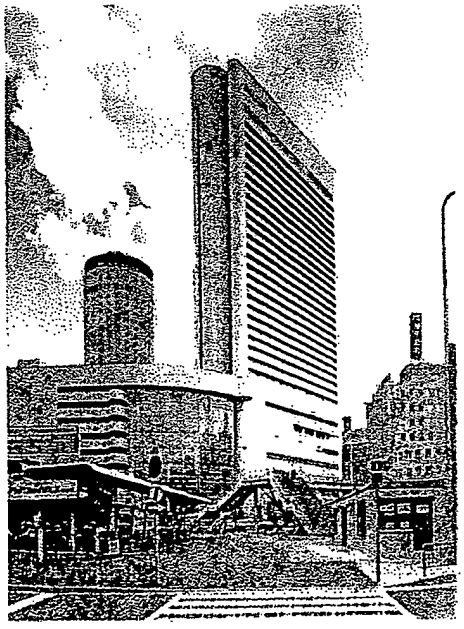
(Kaneka's formulation #105)

Product code number			S203H	S303H	SAX400	Commercial polyurethane for industrial
Viscosity*1 2rpm		Pa・s	760	890	1030	880
Viscosity ratio 2rpm/10rpm			3.3	3.3	3.1	2.6
Tack free time*2		min	60	30	15	35
Cure in depth (23℃ 50%RH)	1 day	mm	3.3	3.3	3.5	3.7
	7days	mm	9.0	8.7	8.9	8.4
Hardness		Shore A	27	36	42	46
Tensile shear*3	Strength	MPa	1.1	1.3	1.7	0.4
	Failure mode*7		C100	C100	C100	C10/A90
T-Peel*4	Strength	N/25mm	41	53	74	70
	Failure mode*7		C100	C100	C100	C90/A10
Tear strength*5		N/mm	7.7	9.9	10.2	12.0
Tensile properties*6 (Dumbbell)	M100	MPa	0.31	0.60	0.78	0.70
	Tb	MPa	1.5	2.2	2.2	1.6
	Eb	%	850	715	565	605
Suggested application	Construction		x	x		
	Industrial			x	x	x

Notes
*1 BS-type viscometer rotor #7
*2 finger touch
*3 cured at 23°C50%RH×3days+50°C×4days JIS K6854 : pure AL (A 1050P)
*4 cured at 23°C50%RH×3days+50°C×4days 25mm width JIS K6854 : pure AL (A 1050P)
*5 cured at 23°C50%RH×3days+50°C×4days JIS K6301(1991) B type
*6 cured at 23°C50%RH×3days+50°C×4days JIS K6301(1991)
*7 C100 : Cohesive failure 100%, C10/A90 : Cohesive failure 10% and Adhesive failure 90%



High Rise Buildings using Two-Components MS Sealant



High Rise Buildings using Two-Components MS Sealant

D. Unprimed Hand-peel Adhesion of One-component Sealant for Construction and Industrial Use

One-component MS sealants offer good adhesion properties to a wide variety of substrates.

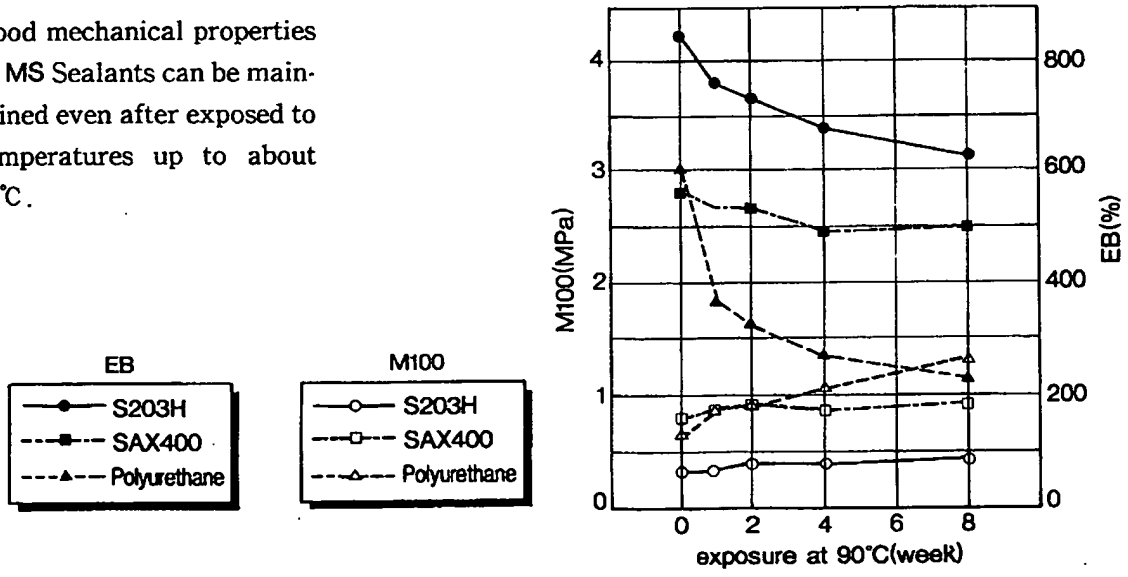
(Kaneka's formulation #105)

Type		KANEKA MS POLYMER and SILYL			Commercial polyurethane
Product code numbers		S203H	S303H	SAX400	
Hand Peel Unprimed Adhesion <DRY/ WET>*1	aluminum	CF/CF	CF/CF	CF/CF	AF/CF
	acrylic-coated aluminum	CF/CF	CF/CF	CF/CF	CF/CF
	brass	CF/CF	CF/MF	CF/CF	AF/AF
	steel	CF/CF	CF/MF	MF/CF	AF/AF
	stainless steel	CF/CF	CF/CF	MF/AF	AF/AF
	rigid PVC	CF/CF	CF/CF	MF/CF	AF/AF
	FRP	CF/AF	CF/AF	CF/AF	CF/CF
	ABS	CF/CF	CF/AF	MF/AF	AF/AF
	acryl resin	CF/CF	AF/AF	AF/AF	AF/AF
	polycarbonate	CF/CF	CF/AF	CF/AF	AF/CF
	polystyrene	AF/AF	AF/AF	AF/AF	AF/AF
	epoxy resin	CF/CF	CF/CF	CF/CF	CF/CF
	glass	CF/CF	CF/CF	CF/CF	MF/AF
	slate	CF/AF	MF/AF	MF/AF	MF/AF
	mortar	CF/AF	CF/AF	MF/AF	AF/MF
	granite	CF/AF	CF/AF	MF/AF	MF/MF
	cherry tree	CF/AF	CF/AF	MF/AF	MF/AF

Note *1 DRY: 23℃50%RH×7days WET: DRY+immersed in water 50℃×7days
CF: Cohesive failure, AF: Adhesive failure, MF: Mixture of cohesive and adhesive failures

E. Heat Resistance

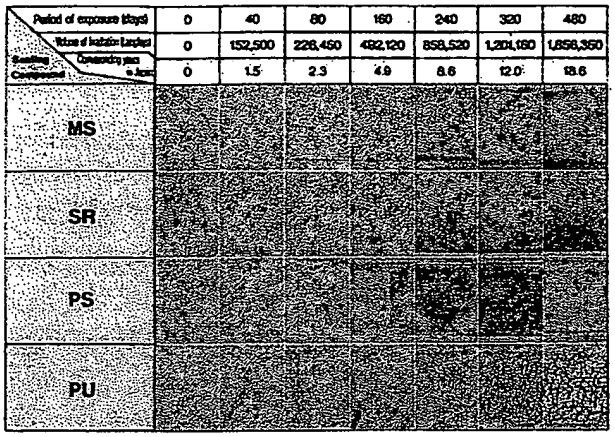
Good mechanical properties of MS Sealants can be maintained even after exposed to temperatures up to about 90℃.



F. Weatherability

Good non-yellowing and non-cracking performance can be obtained with MS Sealants.

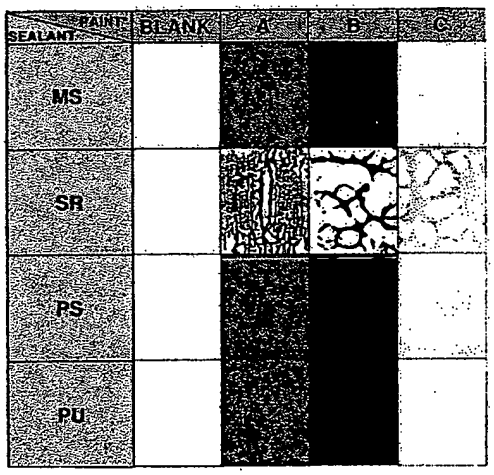
EMMAQUA TEST, ARIZONA, USA



G. Paintability

MS Sealants can be painted with most waterborne finishes. However, the paintability may not be satisfactory for some of the alkyd and solvent type finishes.

PAINTABILITY

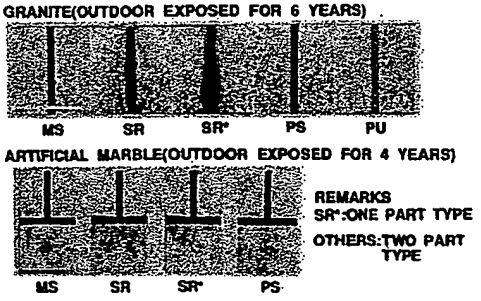


*WATER BASE ACRYLIC PAINT

H. Non-Staining Nature

MS Sealants do not cause staining around the joints. However, when applied to porous substrates, such as natural marble, darkening around the joints may occur.

STAINING PHENOMENA CAUSED BY SEALANTS



I. Typical Two-component Sealant Formulation of MS Sealants

(Kaneka's formulation # LCH)

	Component	Parts(wt)
Main part	KANEKA MS POLYMER	100
	Calcium carbonate	120
	Titanium oxide	8
	Plasticizer	55
	Surface improver	3
	Thixotropic agent	3
	Light stabilizer	1
	UV absorber	1
	Sub total	291
Hardener	Hardening catalysts	3.75
	Plasticizer	6.25
	Titanium oxide	19
	Sub total	29
Main part/ hardener ratio (wt/wt)		10/1

J. Features of Two-component MS Sealants

1) No need for dehydration or moisture control
2) Excellent workability, such as good gunnability and easy surface finish, as well as good compatibility with a variety of pigments
3) Primer is necessary.
4) Fast uniform cure
5) Excellent durability

K. Basic Properties of Two-component Sealant

(Kaneka's formulation # LCH)

Polymer used			KANEKA MS POLYMER S203H
Viscosity*1 2rpm		Pa·s	1,450
Viscosity ratio 2rpm/10rpm			3.7
Pot life*2		hr	8
Hardness Shore A		—	27
Tensile properties (dumbbell)*3	M100	MPa	0.24
	TB	MPa	1.45
	EB	%	860

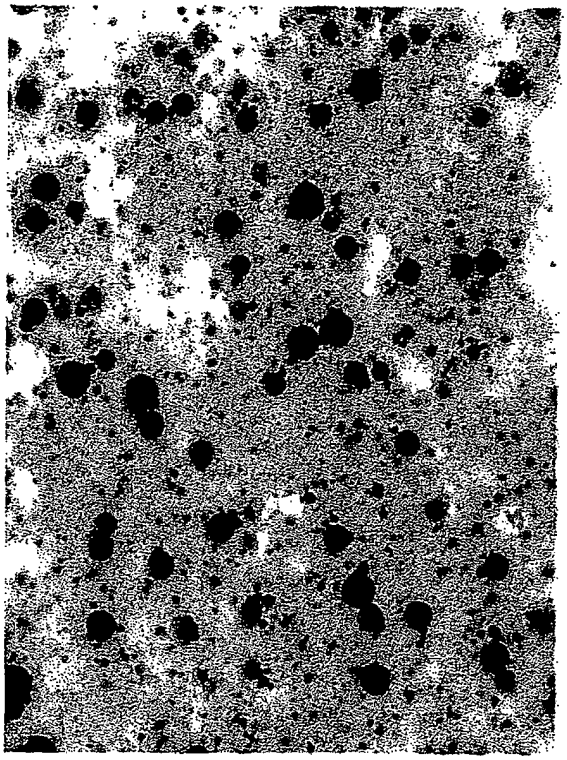
Note *1 BS-type rotor#7(main part), *2 as skin formation
*3 cured at 23°C50%RH×3days+50°C×4days JIS K6301(1991) 200mm/min

4. Epoxy-blended Adhesive Application

A. Concept of Elastic Adhesive

KANEKA SILYL blended with epoxy resin can be cured in the presence of both moisture and catalyst to form the phase-separation morphology where rigid epoxy particles are dispersed in the continuous elastic KANEKA SILYL phase. Elastic phase contributes to the relaxation of internal stress and movements between different substrates. The epoxy phase contributes to high strength as well as water resistance. This structure realizes both high tensile strength and good elongation, maintaining long-term performance.

Both non-filler and filler-containing formulations are possible, dependent on end-use requirements.



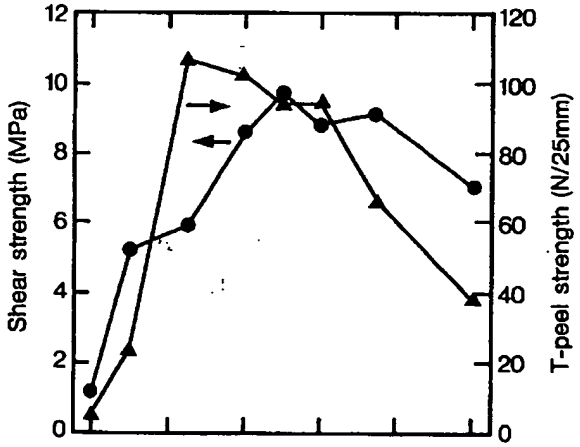
1μm

TEM photograph of cured SILYL/epoxy. (black particles;epoxy)

B. Blend Ratio

SILYL/epoxy (2/1 by weight) is the most optimum blend ratio to have good performance. If epoxy is used in excess, insufficient solubility between KANEKA SILYL and epoxy may occur due to its phase diagram.

Adhesive strength — Epoxy blend ratio



Epoxy wt. (phr)	0	20	40	60	80	100
KANEKA SILYL wt. (phr)	100	100	100	100	100	100

C. Typical Two-component Epoxy-blend Adhesive(non-filler)

In order to assure good storage stability, a hardener for epoxy resin should be incorporated into Part A (KANEKA SILYL's side) while a hardening catalyst for KANEKA SILYL should be added in Part B (epoxy's side).

(Kaneka's formulation #N-5)

	Component	Parts(wt)
Part A	KANEKA SILYL	100
	Hardener for epoxy	5
	Adhesion promoter	2
	Sub total	107
Part B	Epikote 828	50
	Hardening catalyst for KANEKA SILYL	2
	Water	0.5
	Sub total	52.5
Part A/Part B(wt/wt)		107/52.5

D. Typical Mechanical Properties of Two-component Adhesive(non-filler)

(Kaneka's formulation #N-5)

			SILYL/epoxy		Commercial rigid epoxy for industrial
Polymers used			SAT030	SAX350	
Type			High modulus	Standard	
Cure rate*1	Skin formation time (min)		30	20	130
Tensile property*2	M_{100}	MPa	1.6	0.85	—
	TB	MPa	8	10.0	54
	EB	%	320	530	3
Hardness	Shore A		60	50	>100
Tear strength*3	N/mm		16	33	22

Notes *1 at 23°C50%RH
*2 cured at 23°C50%RH×3days+50°C×4days JIS K6301(1991) 200mm/min
*3 cured same above JIS K6301(1991) 500mm/min

E. Unprimed Adhesion of Two-component Epoxy-blended System

Epoxy-blended system shows excellent balance between shear and peel strength.

(Kaneka's formulation #N-5)

Substrate	Surface treatment*1	Tensile shear (MPa)*2	CF ratio (%)	Peel strength (N/25mm)*3	CF ratio (%)
Steel	A	9.9	70	—	—
Stainless steel	A	6.3	50	120	100
Brass	A	7.6	70	—	—
Aluminum	A	10.4	90	94	100
Rigid PVC	B	3.6	0	—	—
ABS	B	3.6	0	—	—

Notes Polymer type : SAX350 cured at 23°C50%RH×3days+50°C×4days
*1 A : acetone wiping, B : ethanol wiping
*2 5mm/min
*3 200mm/min

Product Safety

Always be sure to exercise utmost care in handling the materials contained in this brochure in order to avoid a hazard. It is suggested that our latest material safety data sheet be reviewed for detailed health and safety information prior to use.

Important Notice

KANEKA MS POLYMER and KANEKA SILYL are not intended to be used alone, nor as a component of compounds that come in contact with food. Sellers of KANEKA MS POLYMER and KANEKA SILYL are free of any damage, claim or complaint that may arise from contact between the products and any food.

All technical statements, information and recommendations in this brochure are based on tests and data which are believed to be reliable. Due to possible variations of conditions and processing methods beyond our control, no guarantees or warranties are expressed or implied as to the use, handling or processing of the materials involved. Nor do we guarantee product marketability or suitability to specific purposes. No suggestions are made in the catalogue whatsoever for infringement of any patents.

We expressly disclaim liabilities for any damage resulting from the use, handling or processing of KANEKA MS POLYMER and KANEKA SILYL, and for the results arising therefrom regardless of whether or not the material has been used, or is alleged to have been used, in accordance with the instructions given in this brochure.

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2003.3.1200E

Nitto Kasei Co., Ltd.

Nitto Technical Data:

NEOSTANN U-220H

NEOSTANN U-220H

NEOSTANN U-220H is a catalyst based on di-butyltin bis(acetylacetonate). NEOSTANN U-220H is widely used for the catalyst of polyurethane and silicone resin.

Properties are shown below:

- Appearance---------- Yellow liquid
- Specific gravity at 30℃---------- 1.215-1.230
- Refractive index at 30℃---------- 1.515-1.520
- Viscosity at 30℃---------- 20-40cps.
- Tin content---------- 27.5%
- Solubility---------- Soluble in organic solvents, insoluble in water.
- Melting point---------- 15-30℃
- Flash point---------- 167℃ (Cleveland O.C)

- CAS No.22673-19-4
- JPN C.S.C.Law No.2-3458
- EINECS No.245-152-0
- TSCA : Approved

(01.02.01)

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TEL +81-6-6322-4351 FAX +81-6-6322-6555 URL http://www.nittokasei.co.jp

MATERIAL SAFETY DATA SHEET DIRECTIVE 2001/58/EC

Product Name : NEOSTANN U-220H
Revision Date : Feb.19.2003

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 IDENTIFICATION OF THE PRODUCT

NEOSTANN U-220H

1.2 USE OF SUBSTANCE

Catalyst for sealant and adhesives formulations

1.3 COMPANY

<Manufacturer>
NITTO KASEI CO., LTD.
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Osaka, Japan
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FAX:+81-6-6322-6555

<Sales Representative>
KANEKA BELGIUM N.V.
NIJVERHEIDSSTRAAT 16
B - 2260 WESTERLO - OEVEL

TEL: 32(0)14/21.49.44

1.4 EMERGENCY CONTACT

KANEKA BELGIUM N.V.
TEL: 32(0)14/21.49.44
TEL: 32(0)14/25.78.10

2. COMPOSITION, INFORMATION ON INGREDIENTS

2.1 CHEMICAL COMPOSITION	Dibutylbis (pentane-2, 4-dionato-O,O')tin
2.2 CAS No.	22673-19-4
2.5 EINECS	245-152-0

3. HAZARDS IDENTIFICATION

Heating of product may generate vapors which form explosive vapor/air mixtures.
Do not swallow. Avoid contact with eyes and skin.
Vapor may cause eye irritation.
Contact to skin and eyes may cause redness, itching, eczema.

4.FIRST AID MEASURES

Eye Contact : Immediately flush with running water for at least 15 minutes. Obtain medical advice immediately.

Skin Contact : Remove contaminated clothing immediately and wash with soap and water. Obtain medical advice immediately.

Inhalation : Move injured person into fresh air. Administer oxygen only if here is blueness or air hunger. Obtain medical advice immediately.

Swallowing : Immediately rinse mouth and give plenty of water to drink. Do not give milk any oily substance, fat or alcohol. Obtain medical advice immediately.

5.FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Use powder or dry sand CO_2 for a small fire. For large fire, it is effective that air supply is stopped with extinguisher such as foam.

Unsuitable Extinguishing Media

Avoid spraying with water due to the danger of potential spreading.

Exposure Hazards

By heating and fire, harmful vapors (CO, CO_2) may be produced.

Special protective equipment for firefighters

Wear full protective clothing, wear self-contained breathing apparatus.

6.ACCIDENTAL RELEASE MEASURES

Personal Precautions

Wear gloves and protective clothing to minimize contact with skin and wear safety glasses or goggles to avoid eye contact.

Environmental Precautions

Remove spark sources and open flame.

Avoid contamination of the soil, and avoid drain-off in the sewerage, drainpipes and surface water.

Methods for Cleaning

Absorb spilled liquid with sawdust, sand or waste. Sweep up and place in a container which should then be closed and suitably labeled for disposal.

7.HANDLING AND STORAGE

7.1 Handling

Keep away from sparks, heat, and open flame.
Local ventilation should be required during handling.
Avoid inhalation of vapors and contact with skin and eyes.

7.2 Storage

Keep containers tightly sealed and avoid moisture and water as this product is reactive with moisture. (Reaction with moisture or water will cause quality deterioration, but it will not be hazardous.)
Do not enter confined fire area without proper protective equipment including self-contained breathing apparatus.

7.3 Specific use

Not applicable, the product described in this MSDS is not end product.

8.EXPOSURE CONTROLS, PERSONAL PROTECTION

8.1 Exposure limit values

Not established

8.2 Exposure controls

8.2.1.1 Respiratory Protection

Use respirator as required to prevent overexposure.

8.2.1.2 Hand Protection

Wear gloves to avoid contacting with hands.

8.2.1.3 Eye Protection

Wear suitable safety glasses or goggles to avoid eye contact.

8.2.1.4 Skin Protection

Wear gloves and other protective clothing to minimize contact with skin.

8.2.2 Environmental exposure controls

Not particular measured required

9.PHYSICAL AND CHEMICAL PROPERRTIES

9.1 General information

Appearance	:	Liquid
Color	:	Yellow
Odor	:	Slight

9.2 Important health, safety and environmental information

pH	:	Not applicable
Boiling Point	:	Not available
Flash Point	:	167°C (333°F) (Cleveland, o.c.)
Flammability	:	Not applicable
Explosive properties	:	Not applicable
Oxidizing properties	:	Not applicable
Vapor Pressure	:	132°C (270°F)/0.5P
Relative density	:	1.210-1.225 (30°C)
Solubility in water	:	Insoluble, Decompose
Solubility in fat	:	Not established
Partition Coefficient	:	Not available
Viscosity	:	20-40 mPa.s (30°C)
Vapor density	:	Not available
Evaporation Rate	:	Not available

9.3 Other information

Melting Point	:	15-30°C (59-86°F)

10.STABILITY AND REACTIVITY

10.1 Condition to Avoid

Keep away from sun-light, heats, sparks, and open flame.

10.2 Material to Avoid

Avoid contact with acid, alkali, moisture, water, and oxidizing materials. (Reaction with moisture and water will no hazardous.)

10.3 Hazardous Decomposition Products

Thermal decomposition may produce toxic fumes of CO, CO_2, or tin compounds.

11.TOXICOLOGICAL INFORMATION

Acute Oral Toxicity : LD_{50} (Rat) ≥2000mg/kg

12.ECOLOGICAL INFORMATION

12.1 Ecotoxicity	:	Unknown
12.2 Mobility	:	Unknown
12.3 Persistence and Degradability	:	Unknown
12.4 Bioaccumulative Potential	:	Unknown
12.5 Other adverse effect	:	Unknown

13. DISPOSAL CONSIDERATIONS

Disposal should be made by incineration or in accordance with applicable government regulation.

14. TRANSPORT INFRMATION

UN No.	:	Not applicable
IMDG code	:	Not applicable

15. REGULATORY INFORMATION

EINECS	:	245-152-0
TSCA	:	listed
ENCS	:	2-3458
DSL	:	listed
AICS	:	listed
ECL	:	listed

16. OTHER INFORMATION

Labeling (according to Directive 67/548/EEC)

R-Phrases : 36/38 Irritating to eyes and skin.

S-Phrases	:	24/25	Avoid contact with eyes and skin.
		26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
		36/37/39	Wear suitable protective clothing and eyes/face protection.

This product should be stored, handled, and used in accordance with good industrial hygiene practices and in conformity with any legal regulation. The information contained herein is based on the present state of our knowledge and is intended to describe our product from the view of safety requirements. It should not be construed as guaranteeing specific properties.